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SURVEY OF THE BROKER AND RETAIL SECTORS OF THE FISH MARKETS IN HAWAII FINAL REPORT

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PREFACE

This report was prepared under contract (No. 03-75-M02-270) by SMS Research of Honolulu, Hawaii. The objective of the contract was to complement earlier surveys of the wholesale seafood market in Hawaii by undertaking a stratified survey of retail firms selling seafood. The survey took place from November 1982 through March 1983. Since this report was prepared under contract, the statements, findings, conclusions, and recommendations herein are those of the contractor and do not necessarily reflect the view of the National Marine Fisheries Service.

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June 30, 1983

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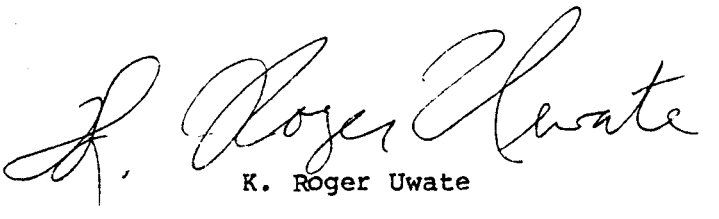
PREFACE

This report documents all activities related to the SURVE OF THE BROKER AND RETAIL SECTORS OF THE FISH MARKET IN HA AII As stipulated in the original proposal, this report summarizes the fielding efforts, and includes a brief analysis of the survey results.

In addition, this report includes a section on considerations and suggestions which may be taken into account if monitoring of this sector is later desired.

Supplemental to this report is a magnetic tape of survey results which has been submitted to the National Marine Fisheries Service, Honolulu Laboratory. Also, the following items have been submitted to N M.F S. under a separate cover:

- Fish Broker Questionnaire
- Retail Fish Questionnaire and Display Card
- Letter of Introduction to Fish Brokers/Retailers
- Codebook for the Fish Broker Survey Questionnaire
- Codebook for the Retail Fish Market Survey Questionnaire
- List of Fish Brokers Surveyed
- List of Retail Outlets Surveyed by Economic Unit



K. Roger Uwate
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INTRODUCTION

The passage of the Magnuson Fishery Conservation and Management Act (1976) and the publication of the Hawaii Fisheries Development Plan (1979) have brought the need to better understand the ramifications of fisheries policy on the fish market system to the attention of agencies involved with fisheries management.

The Honolulu Laboratory of the National Marine Fisheries Service (NMFS) initiated a two-phase market data collection effort to provide a basic picture of the fish market system in Hawaii.

The first phase was aimed at the wholesale fish market sector. An enumeration study of total product flow for all wholesale firms was done in August 1980. This study provided the basis for a monthly survey of a stratified sample of wholesale fish marketing firms (October 1981 to April 1982).

The second phase was an analysis of the retail sector, which was addressed in this project. NMFS desired baseline information on the retail sector of the fish marketing system to include HRI's (hotels, restaurants, and institutions).

The stated objective of this project was to collect and do a preliminary analysis on annual quantity and dollar value data of fish products at the retail level. This was done with a one-time survey based on a stratified sampling of retail economic units (which were outlined by NMFS). This preliminary study should provide the data base necessary for future analysis of this market sector, as well as for future fishery management decisions.

SAMPLE DESIGN

THE UNIVERSE

Prior to defining a sample, the universe had to be determined. The universe of the broker/retail sector of the fish market in Hawaii was divided into 11 economic units. These units included:

1. markets
2. fast food outlets
3. Federal agencies
4. State agencies
5. hotels/catering firms
6. restaurants
7. retail fish markets
8. schools
9. hospitals (private)
10. nursing homes (private)
11. fish brokers

Most of these economic units were further differentiated into subgroups (see Table 1).

The universe for each unit was defined primarily from listings in the telephone book. In addition, inquiries were made to identify federal and state points of fish consumption.

Assignment of firms to different groups was based on the following procedure. For supermarkets and grocery stores, a store having three or more outlets was considered a supermarket chain (including Fastop and 7-Eleven chains). Those with fewer were counted as "grocery stores," and each outlet was considered one firm for sampling purposes.

For fast food outlets, firms which had four or more outlets were considered to be large fast food chains. Firms with less than four outlets were included among the independent firms. Each outlet of firms with less than four outlets was then counted as an individual entity or firm for sampling purposes.

Differentiation of large and small hotel/resorts and retail fish markets was made based on the staff's current knowledge of these firms. Although subject to error, separation in this manner assisted in narrowing the variance of estimations obtained in sampling.

The placement of firms into economic units also involved some judgment. For instance McDonalds, which is both a restaurant and a fast food outlet, was put into the fast foods category. Some firms such as Shirokiya are listed as caterers, restaurants, and grocery stores. Its catering and restaurant functions are under one unit; therefore, it was categorized as a restaurant (its major function). However, its market function is also significant, but separate, so it was also categorized as a grocery store.

SAMPLE SIZE

The sample size, based on per interview cost estimates provided by SMS Research, was determined by NMFS. A sample size for retail firms with Central Purchasing Offices was 23, and for individual firms it was 163. For brokers, sample size was seven. The sample size for each economic unit of the retail sector is listed in Table 1.

SAMPLE SELECTION

Firms were randomly selected from the list of the universe for each economic unit. A primary list of firms to be surveyed was selected having the appropriate number of firms (equal to the sample size). A secondary list of firms was also selected as a back up if firms on the primary list needed to be replaced if they refused to participate or were out of business.

In consultation with the COTR, it was decided that if a firm did not sell fish, it would be replaced in the survey. However, to avoid the problem of continuously replacing firms, especially in economic units in which few firms handled fish, a limit was established on the total number of firms approached in any one economic unit. This limit was the secondary list.

QUESTIONNAIRES

Two questionnaires were developed for this survey. For the fish brokers, the Wholesale Fish Enumeration Study questionnaire was modified so that the

intent of the specific questions made sense to brokers. A copy of this Fish Broker questionnaire is provided separate to this report.

For retailers, a new questionnaire was developed using components of both the Wholesale Fish Enumeration questionnaire and the Monthly Survey of Wholesale Fish Markets questionnaire. This Retail Fish questionnaire is presented separate to this report.

The Retail Fish Questionnaire focused on a fish species of importance to NMFS. It is more complex than the Fish Broker Questionnaire because of the heterogeneity of the economic units in the fish retail sector.

EXTRAPOLATION FORMULAE

The following extrapolation formulae are applicable to the broker/retail fish market study of Hawaii. It is recommended that brokers be segregated from retailers and their total sales estimates be calculated separately.

Brokers

Since all brokers were to be approached, a total of their fish/seafood business (X_B) could be simply obtained by summing together the total business of each broker.

$$\hat{X}_B = \Sigma x_i$$

where x_i is the total business (in dollars or specific seafood volume) for the i^{th} firm. If all brokers responded to the survey, there would be no variance.

Retailers

First the retailers surveyed are sorted by economic unit.

Let $N_{j1}, N_{j2}, \ldots N_{jk}$ be the population size in each stratum of the j^{th} economic unit.

Let $n_{j1}, n_{j2}, \ldots n_{jk}$ be the sample size of each stratum of the j^{th} economic unit.

For the k^{th} stratum of the j^{th} eccnomic unit, the estimate for the total aggregate ($\hat{X}_{jk}$) for any variable (fish/seafood volume, or dollar value) is:

$$\hat{X}_{jk} = N_{jk} \ (\Sigma x_{jki}) \ / \ n_{jk} = N_{jk} \ (\bar{x}_{jk})$$

where x_{jki} is the i^{th} observation in the k^{th} stratum of the j^{th} economic unit. $\bar{x}_{jk}$ is the mean value for the k^{th} stratum of the j^{th} economic unit.

The variance of the sample (s_{jk}^2) for this total aggregate is:

$$s_{jk}^2 = \Sigma \ (x_{jki} - \bar{x}_{jk})^2 \ / \ (n_{jk} - 1)$$

The total aggregate for all strata for the j^{th} economic unit is then calculated as:

$$\hat{X}_j = \Sigma \ N_{jk} \cdot \bar{x}_{jk} = \Sigma \ \hat{X}_{jk}$$

The variance for the total estimate for the j^{th} economic unit is:

$$s_{\hat{X}_j}^2 = \frac{1}{N^2} \Sigma \ N_{jk} \ (N_{jk} - n_{jk}) \ s_{jk}^2 / n_{jk}$$

The total aggregate for the entire retail sector ($\hat{X}_R$) is:

$$\hat{X}_R = \Sigma \ \hat{X}_j$$

Specific application of the extrapolation formulae for retailers is as follows:

1. Segregate raw data by each stratum and economic unit.
2. Apply extrapolation formulae to any variable (volume of specific seafood or fish, total volume, or total dollar value of purchase/sales).

Estimates calculated here feature very small sample sizes as well as large sampling error. However, these estimates should provide a better picture of the retail/broker sector of the fish market in Hawaii than the current guesstimation now employed.

DATA COLLECTION

A letter of introduction from NMFS to firms selected to be surveyed was drafted, approved by NMFS, and sent out. A copy of this letter is included separate to this report.

In addition, copies of the Administrative Report H-82-15, by J. C. Cooper and S. G. Pooley titled "Total Seafood Volume in Hawaii's Wholesale Fish Market" were obtained from NMFS. These were distributed to firms surveyed in this study. Not all firms surveyed received copies of this report as the fielding effort was initiated prior to receipt of reports.

According to the fielding director, the distribution of this report had little affect on fielding efforts and survey responses.

Fielding efforts for this study actually were initiated in the third week of November 1982. However, on November 23, 1982, the Hawaiian Islands were hit with Hurricane Iwa. The hurricane caused major destruction on the Island of Kauai, and considerable inconvenience on the other islands.

As a result of the hurricane, our initial fielding efforts during the third week of November were quite limited. A decision was also reached that the fish retailers on the Island of Kauai would be deleted from our samples. They had endured enough hardships and did not need the additional burden of participating in this study. This decision was based on discussions with the COTR.

Fielding efforts were completed by March 1983. This included the follow-up surveys for the military sector which were delayed until February, pending a decision by the COTR.

FISH BROKERS

The universe for fish brokers in Hawaii included seven firms. All seven firms were approached in this study. Indo-Pacific Fisheries, Inc. was out of business. Emerald of Hawaii refused to participate in the survey as they were "busy." Five completed surveys were obtained for fish brokers in Hawaii.

MARKETS

In the universe, 15 supermarket chains were identified (see Table 1). Two, Big Save, Inc. and Happy Kauaian Market, were omitted from the survey as they were located on Kauai. This left 13 firms to be surveyed. All remaining 13 were approached (see Table 2).

The survey of grocery stores was straight forward. The quota of 20 outlets was met without difficulty (see Table 2).

FAST FOOD OUTLETS

All 12 fast food chains in the universe were approached (see Table 2). Four refused to participate in the survey. They included: Burger King, Magoo's Pizza, Pioneer Take-Out Corp., and Wendy's (McWew Corp). Burger King and Wendy's sell fish sandwiches, and Pioneer has a fish and chip dinner. The only fish product Magoo's uses is the anchovies it puts on pizzas.

The four fast food chain which had no fish sales included: Church's Fried Chicken; Kentucky Fried Chicken; Pizza Hut Restaurants; and Taco Bell.

Independent fast food outlets were surveyed without difficulty. The survey quota of 10 was met without difficulty (see Table 2).

MILITARY OUTLETS

Fish outlets at military posts in Hawaii were part of this study. However, fielding efforts were not initiated with this economic unit at the beginning of the study because the COTR indicated that military consumption information might be obtained from a central federal or military source. In February, the COTR indicated that data on military food outlets was probably not obtainable as originally anticipated. A sample of military food outlets was selected, then surveyed.

STATE/COUNTY AGENCIES

Fielding efforts of State/County agencies were straight forward. The survey quota was met with minimal sample replacement (see Table 2).

HOTELS/CATERING FIRMS

No difficulties were experienced in surveying chain/large hotels or catering firms (see Table 2). However, the fielding efforts of small hotels yielded rather surprising results. Nine small hotels were approached during fielding efforts (Table 2). Seven did not sell fish, which also indicated that they did not have a hotel restaurant or coffee shop. One small hotel refused participation, and only one had fish and completed the survey.

RESTAURANTS

No difficulty was encountered in fielding efforts of seafood, Japanese/Chinese, and other restaurants. A surprisingly high number of "other" restaurants were "out of business." This amounted to 33 percent of "other" restaurants randomly selected to be surveyed.

RETAIL FISH MARKETS

For both large and small retail fish markets, surveying became difficult. Of 35 large firms, 25 were contacted with 20 responding. Of 44 smaller firms, 26 were contacted, and 19 completed the survey.

Many of the firms selected had already been approached in the wholesale enumeration and monthly survey. Thus, some were hesitant to participate in another survey.

SCHOOLS

For the primary and secondary schools, we were fortunate to obtain a completed interview with the Food Central Purchasing Office for Public Schools on Oahu, which represents 162 public schools. Therefore, the two completed interviews reported understate the actual amount of information obtained for this economic unit.

It should also be noted that many of the trade schools and smaller colleges did not have their own cafeterias. Half of the colleges/universities/ trade schools (4 of 8) did not sell seafood. These included: Windward Community College, Wayland Baptist College of Hawaii, University for Humanistic Studies, and ICS/CDS Schools and Employee Management Development.

PRIVATE HOSPITALS/NURSING HOMES

No problems were encountered in fielding efforts related to private hospitals and nursing homes (see Table 2).

DATA ENTRY

Data entry onto computer magnetic tape was done according to the code books for the Fish Broker Survey questionnaire and that for the Retail Fish Market Study questionnaire. These codebooks are provided separate to this report.

It should be noted that in both questionnaires, the responses to certain questions were logically to sum to 100 percent. This was not often the case with actual responses. To compensate for this, responses to these questions were adjusted proportionately so that they would sum to 100 percent.

RESULTS

BROKER SECTOR

The following discussion is based on responses from the five fish brokers surveyed.

One hundred percent of the total business for all firms was from broker activities. Specialization in terms of products handled was evident as firms handled either 100 percent fresh, frozen, or canned/bottled fish (see Table 3). No firm handled more than one seafood product form. Also, no broker handled salted/dried/smoked fish or fishcakes. In addition, no broker was involved with non-food seafood items.

Most seafood products went to local wholesalers, irrespective of form, although one broker did distribute a significant amount of seafood (60%) to local retailers, and some (10%) to local processors.

In Table 3, values of broker activities are presented. In addition, estimates are presented where data was not provided. It should be noted that there are several methods for calculating estimates. The method followed here uses the number of employees as a weighting factor for estimating values not reported. Straight expansion of values for firm 5 could also have been used to estimate missing values of firms 2 and 4, but it was felt that a better estimate was possible using employee numbers as the weighting factor. Notes at the bottom of Table 3 illustrate how estimates were calculated.

Total annual estimates were calculated based on reported and estimated values presented in Table 3. Calculations were done as follows:

Let $N = 6$, the population size; and $n = 5$, the sample size

The estimate of any variable x (fish weight or dollar value) for the total aggregate is $\hat{X}$.

$$\hat{X} = N \ (\Sigma x) / n$$

This estimate can be calculated for a product state (fresh, frozen, canned/bottled) or for total values (by weight or dollar value).

For example:

(1) fresh fish = $\hat{X}$; $\hat{X}$ = 6 (450,000)/5 = 540,000 lbs.

(2) total seafood = $\hat{X}$; $\hat{X}$ = 6(7,036,500)/5 = 8,440,000 lbs.

The equation for calculating variance is: $s^2 = \Sigma (x-\bar{x})^2 / (n-1)$

Since not all brokers were surveyed, there is a variance associated with each estimate. For fresh fish and canned/bottled fish, this variance is extremely large because only one of five firms handles each of those products.

For frozen and total seafood estimates, variance should not be calculated, as the base numbers used in these calculations are just estimates themselves.

Estimates of total aggregate volumes and dollar values are presented in Table 4. These estimates indicate that brokers handle a large portion of the frozen seafood volume in the state. Their participation in the fresh fish market is much more limited, especially when compared with data from the wholesale study in 1980 (see Cooper and Pooley 1982).

RETAIL SECTOR

The fielding efforts for the retail sector are presented in Table 2. Population size estimates of N were adjusted based on results of this fielding effort (see Table 5). Two factors were included in these adjustments, one for firms with no fish/seafood and the other for firms out of business. The resultant adjusted N was the basis for later expansion of mean sample estimates.

Responses to question 37 on total purchases for 1982 were talleyed and mean estimates were calculated. Tables 6 to 11 present sample and expanded strata estimates for each response in question 37 (variable K76 to K81). Mean estimates were based on the number of firms which responded to the question (n), not on the total number which were surveyed. The expanded strata estimates were calculated by multiplying the appropriate adjusted population estimate N (from Table 5) by the appropriate mean estimate.

One additional change in strata was made here. Since the entire public school system in Oahu was surveyed in addition to two private schools, primary

and secondary schools were segregated into public and private types (see Table 5). Numerical estimates of public and private schools by island were obtained from the Hawaii Data Book (1982). The one interview for public schools in Tables 6 to 11 represents all 162 public schools on Oahu. This was expanded up for 230 public schools in the state.

One of the two private schools interviewed did not serve fish, thus the adjusted N (Table 5) was 73 (½ x 146). This value was the basis for expanding the sample estimate, to the estimate for the strata of private schools (see Tables 6 to 11).

In addition, the variance of each sample (s^2_{jk}) was calculated and presented in these tables. Again, it should be noted that variance was calculated based on the number of firms which responded to the particular question, not on the total number of firms which were approached for any one strata. Variances calculated were large (in the order of 10^6 to 10^{12}). This can be attributed to the small sample sizes, and the heterogeneous nature of each strata.

Total aggregate estimates for each economic unit are presented in Tables 12 to 17. Estimates for each strata (from Tables 6 to 11) were combined to generate estimates for each economic unit. In addition, total estimates for the retail sector are presented in these tables as the sum or total estimates for all economic units (see bottom figures at the bottom of Tables 12 to 17).

In Table 18, a summary is presented on the retail seafood purchased in 1982. Frozen fish volume purchased was greater than fresh fish volume purchased. However, dollar value of fresh fish purchased was slightly higher than that of frozen fish. These differences in estimates are probably minimal when the magnitude of the estimate variances (see Tables 6 to 11) are considered.

In addition to estimating total purchases of fresh, frozen, and total seafoods, estimates were also made on total seafood sales. This was based on responses to Question 38 on the survey instrument (variables K82 to K87). Responses were limited to supermarkets, grocery stores, fish markets, and military food markets. Sample and strata estimates are provided in Tables 19 to 24. In addition, estimates of the sample variances are also provided in

these tables. As with estimates on seafood purchases, these sales estimates have large variances (in the order of 10^8 to 10^{12}).

Also, total estimates of seafood sales were calculated for all markets. These estimates are presented at the bottom of Tables 19 to 24. These estimates are summarized in Table 25 with estimates from seafood purchases at these markets. Comparisons between purchases and sales are difficult, as variance of estimates are large (see Tables 19 to 24).

DISCUSSION AND RECOMMENDATIONS

BROKER SECTOR

The broker sector was surprisingly heterogeneous. Each firm was specialized, dealing with only one product form. Most firms approached were quite willing to participate in the survey.

One area which surfaced after this study was underway was that food brokers may also handle seafood products. This area was not considered in design and development of this project. Emphasis was instead placed on brokers which were specifically identified (by the yellow pages) as dealing with fish.

It is recommended that a two step survey be undertaken in future studies. In the first step, the universe would be identified based on two screening questions:

1. Do you handle seafood?
2. If yes, what seafood products do you handle?

This can be done quickly over the telephone in a short conversation. This step should also be applied to the 50 plus food brokers listed in the yellow pages.

Once this is completed, an accurate picture can be obtained for the broker universe. This foundation can serve as a basis for sampling firms dealing with specific product forms.

Indications are that fish brokers primarily deal with only one product form. If this holds for the "universe of brokers" then brokers could be stratified by product form, then sampled and surveyed.

Sample size can be determined after the initial step is completed and the possibility of stratification by product form has been explored. Sample size would be based on (1) the universe size determined from step one, (2) the level of confidence desired in the estimate, and (3) funds available for the study.

The second step would be the actual person-to-person survey of selected

broker firms. An updated version of the survey instrument used here for the broker sector would be adequate for this second step.

RETAIL SECTOR

The retail sector in Hawaii is extremely large and heterogeneous. The two step approach suggested for the broker sector would be impractical here for the entire retail sector. However, it may have application to certain economic units.

For the retail sector, it is suggested that initial efforts be aimed at identifying and obtaining data from Central Purchase Offices for the military, public schools, supermarket chains, and fast food chains. If this study is repeated at a later date, it is recommended that some initial effort be directed at first identifying market sectors with central purchasing types of offices, and then inquiring about the availability and accessibility of desired data.

Once these avenues have been exhausted, then an assessment can be made on what areas remain to be sampled and surveyed. A redefinition of alignment of economic units may be useful to better sample firms engaged in retail fish market operations. The following stratification is suggested:

Markets:
- supermarkets (chains)
- grocery stores
- fish markets
  - large
  - small

Restaurants:
- seafood
- Japanese/Chinese
- other (including cafeterias)
  - chains
  - independents

Hotels/Catering Firms/Clubs
- chains/large resorts
- small hotels

catering firms

night clubs (including cocktail lounges)

Institutions

hospitals/nursing homes

correctional facilities

primary/secondary schools

college/university/trade schools

If information on military markets and food services is not available from a central purchasing office, then their outlets should be included in the sample. However, instead of segregating military outlets into a separate category as was done in the survey, it would be more efficient to combine them into the appropriate function category, i.e., put military cafeteria/restaurants into the "other restaurants" category. Military snack bars could be placed into the fast food outlet section. Efforts could then be focused on a functional area of the market, rather than a host of outlets under the umbrella of the military. This would allow for bigger sample sizes in each area, and a resultant decrease in variances associated with the estimates.

The same approach is recommended for federal, state, and county agencies. Instead of segregating state/county hospitals, they might be combined under the "institution" umbrella as hospitals/nursing homes. The same holds for state correctional facilities and schools. Since both state and federal cafeterias function as restaurants, it is suggested that they be included as "other restaurants."

One area which was not addressed in this study was the night club/cocktail lounge segment. Unlike most areas of the mainland U.S., in Hawaii many of these establishments provide "pupu's" to their clientele. Some places sell sashimi, or other snacks to customers, while in other places, the hostesses provide "hors d'oeuvres" purchased from their tip earnings.

In any case, the volume of seafood sold or transferred to the public by this mechanism is probably minimal in comparison to fish markets or restaurants. Since the volume for any one firm is so small, many purchase items directly from retail outlets. This was the situation at Tamashiro's Market, which gives a small discount (5% to 10%) to hostesses or small night club operators for regular pupu purchases.

There is one additional note on night clubs and lounges. The survey instrument used in this study may not be appropriate to the sector if many hostesses purchase pupus individually. If this is the case, no one individual at a night club/lounge would know seafood volumes and types purchased and served. This would compound the difficulty of obtaining data from this sector.

LITERATURE CITED

Cooper, J. C. and S. G. Pooley, 1982. Total Seafood Volume in Hawaii's Wholesale Fish Markets. Southwest Fisheries Center. National Marine Fisheries Service. Administrative Report H-82-15.

Hawaii Department of Planning and Economic Development. 1982. State of Hawaii Data Book; A Statistical Abstract. Honolulu.

TABLES

Table 1
Estimation of Number of Firms In Each Economic Unit

Economic Unit	Stratification	Number of Firms	Sample Size	
			CPO	Firms
MARKETS				
supermarket chains (including Fastop and 7-Eleven)	1	15	14	
grocery stores	2	300		20
FAST FOOD OUTLETS				
chains	1	12	9	
independents	2	152		10
FEDERAL AGENCIES				
cafeteria	1	1		1
military:				
cafeteria/restaurant	2	12		2
clubs	3	11		2
snack bars	4	16		2
food store	5	16		2
hospital (Tripler)	6	1		1
STATE/COUNTY AGENCIES				
cafeteria	1	4		1
correction facility	2	6		2
hospitals	3	8		2
HOTELS/CATERING FIRMS				
chains and large resorts	1	81		8
small hotels	2	211		7
catering firms	3	97		7
RESTAURANTS				
seafood restaurants	1	49		20
Japanese/Chinese rests.	2	126		10
other restaurants	3	1153		10
RETAIL FISH MARKETS				
large	1	35		20
small	2	44		20
SCHOOLS				
primary/secondary	1	374		5
college/university/trade schools	2	16		5
HOSPITALS (private)	0	23		3
NURSING HOMES (private)	0	17		3
			23	163

Table 2
Status of the Fielding Effort for the Retail Sector

Economic Unit	Firms Approached	Interview Completed	Refused	Out of Business	No Fish
MARKETS					
supermarket chains	13	9	2	-	2
grocery stores	24	20	2	-	2
FAST FOOD OUTLETS					
chains	12	4	4	-	4
independents	13	10	1	2	-
FEDERAL AGENCIES					
cafeteria	1	1	-	-	-
military:					
cafeteria/restaurant	2	2	-	-	-
clubs	2	2	-	-	-
snack bars	2	2	-	-	-
food store	2	2	-	-	-
hospital (Tripler)	1	1	-	-	-
STATE/COUNTY AGENCIES					
cafeteria	1	1	-	-	-
correction facility	2	2	-	-	-
hospitals	4	2	2	-	-
HOTELS/CATERING FIRMS					
chains and large resorts	10	8	1	-	1
small hotels	9	1	1	-	7
catering firms	9	7	-	1	1
RESTAURANTS					
seafood restaurants	23	19	3	1	-
Japanese/Chinese rests.	12	11	1	-	-
other restaurants	15	10	-	5	-
RETAIL FISH MARKETS					
large	25	20	4	1	-
small	20	19	3	4	-
SCHOOLS					
primary/secondary	3	2	-	-	1
college/university/trade schools	8	4	-	-	4
HOSPITALS (private)	3	3	-	-	-
NURSING HOMES (private)	4	3	-	-	1
Total Retail	228	165	24	16	23

Table 4

Total Annual Estimates of Broker Business for 1982

	volume (pounds)	dollar value
total fresh fish	540,000	1,260,000
total frozen fish	7,880,000	15,400,000
total canned/bottles fish	28,800	74,000
total seafood	8,440,000	16,700,000

Table 5

Adjusted Population Size (N) For Each Economic Unit

	Original N Estimates	Adjustment For "No Fish" and "Out of Business"	Adjusted N
MARKETS			
supermarket chains	15	2/13	12.69
grocery stores	300	2/24	275
FAST FOOD OUTLETS			
chains	12	4/12	8
independents	152	2/13	128.6
FEDERAL AGENCIES			
cafeteria	1	-	1
military:			
cafeteria/restaurant	12	-	12
clubs	11	-	11
snack bars	16	-	16
food store	16	-	16
hospital (Tripler)	1	-	1
STATE/COUNTY AGENCIES			
cafeteria	4	-	4
correction facility	6	-	6
hospitals	8	-	8
HOTELS/CATERING FIRMS			
chains and large resorts	81	1/10	72.9
small hotels	211	7/9	46.89
catering firms	97	1/9	80.89
RESTAURANTS			
seafood restaurants	49	1/23	46.87
Japanese/Chinese rests.	126	-	126
other restaurants	1153	5/15	768.68
RETAIL FISH MARKETS			
large	35	1/25	33.6
small	44	4/26	37.23
SCHOOLS			
primary/secondary			
(public)	230	-	230
(private)	146	1/2	73
college/university/trade schools	16	4/8	8
HOSPITALS (private)	23	-	23
NURSING HOMES (private)	17	1/4	12.75

Table 6

Sample Size, Mean Estimate (pounds), Expanded Estimate and Sample Variance of Each Economic Unit For All Seafood Purchased

	sample size (n_{jk})	mean estimate ($\bar{x}_{jk}$)	expanded estimate ($\hat{X}_{jk}$)	sample variance (s_{jk}^2)
MARKETS				
supermarket chains	7	1,281,668	16,264,367	2.13×10^{12}
grocery stores	15	7,147	1,965,425	1.74×10^{8}
FAST FOOD OUTLETS				
chains	4	16,2327	1,298,616	2.69×10^{10}
independents	10	1,794	230,708	5.05×10^{6}
FEDERAL AGENCIES				
cafeteria	1	7,400	7,400	-
military:				
cafeteria/restaurant	2	6,050	72,600	3.54×10^{7}
clubs	2	3,452	37,972	4.15×10^{5}
snack bars	2	8,070	129,120	2.25×10^{4}
food store	1	710	710	-
hospital (Tripler)	1	1,512	1,512	-
STATE/COUNTY AGENCIES				
cafeteria	1	4,992	19,968	-
correction facility	2	480	2,880	28,800
hospitals	1	3,045	24,360	-
HOTELS/CATERING FIRMS				
chains and large resorts	7	80,057	5,836,155	1.18×10^{10}
small hotels	1	12,000	562,680	-
catering firms	6	4,552	368,211	1.45×10^{7}
RESTAURANTS				
seafood restaurants	18	42,991	2,014,988	8.81×10^{8}
Japanese/Chinese rests.	11	8,259	1,040,634	1.22×10^{8}
other restaurants	8	2,503	1,923,981	1.10×10^{7}
RETAIL FISH MARKETS				
large	13	526,796	17,700,346	2.71×10^{12}
small	14	37,861	1,409,565	1.71×10^{9}
SCHOOLS				
primary/secondary				
(public)	1(162)	393,129	558,146	-
(private)	1	5,000	365,000	-
college/university/trade schools	4	10,063	80,504	1.80×10^{8}
HOSPITALS (private)	3	6,493	149,339	9.59×10^{4}
NURSING HOMES (private)	3	949	12,100	6.76×10^{5}

Table 7

Sample Size, Mean Estimate (dollar value), Expanded Estimate and Sample Variance of Each Economic Unit For All Seafood Purchased

	sample size (n_{jk})	mean estimate ($\bar{x}_{jk}$)	expanded estimate ($\hat{X}_{jk}$)	sample variance (s^2_{jk})
MARKETS				
supermarket chains	7	2,384,533	30,259,724	1.49×10^{13}
grocery stores	15	16,220	4,460,500	7.65×10^{8}
FAST FOOD OUTLETS				
chains	2	120,579	964,632	1.69×10^{10}
independents	10	2,272	292,179	2.21×10^{6}
FEDERAL AGENCIES				
cafeteria	1	11,800	11,800	-
military:				
cafeteria/restaurant	2	14,090	169,080	1.93×10^{8}
clubs	2	9,145	100,595	1.38×10^{7}
snack bars	2	12,550	200,800	3.25×10^{5}
food store	2	1,286,680	2,058,688	3.30×10^{12}
hospital (Tripler)	1	2,320	2,320	-
STATE/COUNTY AGENCIES				
cafeteria	1	7,430	29,720	-
correction facility	2	825	4,950	1,250
hospitals	1	3,985	31,880	-
HOTELS/CATERING FIRMS				
chains and large resorts	4	337,475	24,601,928	7.02×10^{10}
small hotels	0	-	-	-
catering firms	6	17,017	1,376,505	2.09×10^{8}
RESTAURANTS				
seafood restaurants	18	158,160	7,412,959	1.51×10^{10}
Japanese/Chinese rests.	10	20,318	2,560,068	4.33×10^{8}
other restaurants	8	6,924	5,322,271	9.32×10^{7}
RETAIL FISH MARKETS				
large	14	770,083	25,874,789	4.78×10^{12}
small	13	126,828	4,721,806	4.41×10^{10}
SCHOOLS				
primary/secondary				
(public)	1(162)	405,648	575,920	-
(private)	1	9,500	693,500	-
college/university/trade schools	4	17,276	138,208	5.49×10^{8}
HOSPITALS (private)	2	9,077	208,771	4.71×10^{4}
NURSING HOMES (private)	3	1,683	21,458	2.54×10^{6}

Table 8

Sample Size, Mean Estimate (pounds), Expanded Estimate and Sample Variance of Each Economic Unit For Fresh Fish Purchased

	sample size (n_{jk})	mean estimate ($\bar{x}_{jk}$)	expanded estimate ($\hat{X}_{jk}$)	sample variance (s^2_{jk})
MARKETS				
supermarket chains	8	336,009	4,263,954	3.18×10^{11}
grocery stores	19	2,587	711,425	2.91×10^{7}
FAST FOOD OUTLETS				
chains	4	2,588	20,704	2.44×10^{7}
independents	9	0	0	0
FEDERAL AGENCIES				
cafeteria	1	0	0	-
military:				
cafeteria/restaurant	2	0	0	-
clubs	2	0	0	-
snack bars	2	0	0	-
food store	1	0	0	-
hospital (Tripler)	1	0	0	-
STATE/COUNTY AGENCIES				
cafeteria	1	0	0	-
correction facility	2	0	0	-
hospitals	1	0	0	-
HOTELS/CATERING FIRMS				
chains and large resorts	7	21,254	1,549,417	1.05×10^{9}
small hotels	1	900	42,201	-
catering firms	5	1,196	96,744	2.08×10^{6}
RESTAURANTS				
seafood restaurants	18	22,328	1,046,513	5.00×10^{8}
Japanese/Chinese rests.	11	2,886	363,636	2.49×10^{7}
other restaurants	8	365	280,565	3.80×10^{5}
RETAIL FISH MARKETS				
large	14	176,436	5,928,250	2.20×10^{4}
small	15	38,656	1,439,163	4.28×10^{9}
SCHOOLS				
primary/secondary				
(public)	1(162)	0	0	-
(private)	1	0	0	-
college/university/trade schools	4	593	4,504	4.62×10^{5}
HOSPITALS (private)	3	0	0	-
	3	0	0	-
NURSING HOMES (private)				

Table 9

Sample Size, Mean Estimate (dollar value), Expanded Estimate and Sample Variance of Each Economic Unit For Fresh Fish Purchased

	sample size (n_{jk})	mean estimate ($\bar{x}_{jk}$)	expanded estimate ($\hat{x}_{jk}$)	sample variance (s^2_{jk})
MARKETS				
supermarket chains	8	705,055	8,947,148	1.53×10^{12}
grocery stores	18	6,081	1,672,275	1.77×10^{8}
FAST FOOD OUTLETS				
chains	3	198	1,584	1.18×10^{5}
independents	9	0	0	-
FEDERAL AGENCIES				
cafeteria	1	0	0	-
military:				
cafeteria/restaurant	2	0	0	-
clubs	2	0	0	-
snack bars	2	0	0	-
food store	2	385,650	38,170,400	2.97×10^{11}
hospital (Tripler)	1	0	0	-
STATE/COUNTY AGENCIES				
cafeteria	1	0	0	-
correction facility	2	0	0	-
hospitals	1	0	0	-
HOTELS/CATERING FIRMS				
chains and large resorts	3	107,667	7,848,924	2.11×10^{10}
small hotels	0	0	0	-
catering firms	5	6,474	523,682	7.68×10^{7}
RESTAURANTS				
seafood restaurants	18	75,960	3,560,245	6.73×10^{9}
Japanese/Chinese rests.	10	9,306	1,172,556	3.37×10^{8}
other restaurants	7	276	212,153	1.46×10^{5}
RETAIL FISH MARKETS				
large	15	252,514	8,484,470	3.91×10^{11}
small	15	39,033	1,453,199	2.16×10^{9}
SCHOOLS				
primary/secondary				
(public)	1(162)	0	0	-
(private)	1	0	0	-
college/university/trade schools	4	1,016	8,128	6.74×10^{5}
HOSPITALS (private)	3	0	0	-
NURSING HOMES (private)	3	0	0	-

Table 10

Sample Size, Mean Estimate (pounds), Expanded Estimate and Sample Variance of Each Economic Unit For Frozen Fish Purchased

	sample size (n_{jk})	mean estimate ($\bar{x}_{jk}$)	expanded estimate ($\hat{x}_{jk}$)	sample variance (s_{jk}^2)
MARKETS				
supermarket chains	8	451,630	5,731,185	4.81×10^{11}
grocery stores	15	1,296	356,400	4.80×10^{6}
FAST FOOD OUTLETS				
chains	4	159,739	1,277,912	2.74×10^{10}
independents	10	1,271	163,451	2.84×10^{6}
FEDERAL AGENCIES				
cafeteria	1	5,600	5,600	-
military:				
cafeteria/restaurant	2	4,180	50,160	1.46×10^{7}
clubs	2	2,940	32,340	4.36×10^{5}
snack bars	2	1,590	25,440	3.25×10^{5}
food store	1	0	0	-
hospital (Tripler)	1	360	360	-
STATE/COUNTY AGENCIES				
cafeteria	1	4,800	19,200	-
correction facility	2	200	1,200	80,000
hospitals	1	2,400	19,200	-
HOTELS/CATERING FIRMS				
chains and large resorts	6	76,397	5,569,341	6.56×10^{9}
small hotels	1	6,000	140,670	-
catering firms	6	2,890	233,772	7.73×10^{6}
RESTAURANTS				
seafood restaurants	17	19,977	936,322	3.81×10^{8}
Japanese/Chinese rests.	11	5,179	652,554	7.58×10^{7}
other restaurants	8	2,078	1,597,296	9.76×10^{6}
RETAIL FISH MARKETS				
large	14	183,443	6,163,685	4.07×10^{11}
small	18	12,330	459,046	1.28×10^{9}
SCHOOLS				
primary/secondary				
(public)	1(162)	393,129	558,146	-
(private)	1	3,250	237,250	-
college/university/trade schools	4	8,390	67,120	1.41×10^{8}
HOSPITALS (private)	3	5,380	123,740	2.16×10^{6}
NURSING HOMES (private)	3	788	10,047	3.89×10^{6}

Table 11

Sample Size, Mean Estimate (dollar value), Expanded Estimate and Sample Variance of Each Economic Unit For Frozen Fish Purchased

	sample size (n_{jk})	mean estimate ($\bar{x}_{jk}$)	expanded estimate ($\hat{X}_{jk}$)	sample variance (s^2_{jk})
MARKETS				
supermarket chains	8	514,669	6,531,150	7.76×10^{11}
grocery stores	15	2,871	789,525	1.78×10^{7}
FAST FOOD OUTLETS				
chains	1	28,658	229,264	-
independents	10	1,226	157,664	3.98×10^{5}
FEDERAL AGENCIES				
cafeteria	1	9,000	9,000	-
military:				
cafeteria/restaurant	2	8,200	98,400	6.08×10^{7}
clubs	2	8,625	94,875	1.65×10^{7}
snack bars	2	1,750	28,000	3.97×10^{5}
food store	1	899,850	14,397,600	1.62×10^{12}
hospital (Tripler)	1	400	400	-
STATE/COUNTY AGENCIES				
cafeteria	1	5,712	22,848	-
correction facility	2	250	1,500	125,000
hospitals	1	2,952	23,616	-
HOTELS/CATERING FIRMS				
chains and large resorts	3	131,967	9,620,394	3.66×10^{10}
small hotels	0	0	0	-
catering firms	6	7,472	604,410	4.10×10^{7}
RESTAURANTS				
seafood restaurants	17	65,600	3,074,672	4.29×10^{9}
Japanese/Chinese rests.	10	20,254	2,552,004	9.82×10^{8}
other restaurants	8	5,756	4,424,465	9.54×10^{7}
RETAIL FISH MARKETS				
large	13	295,372	9,924,499	9.29×10^{11}
small	16	53,141	1,978,439	3.47×10^{10}
SCHOOLS				
primary/secondary				
(public)	1(162)	405,648	575,920	-
(private)	1	7,050	514,650	-
college/university/trade schools	4	13,533	108,264	3.99×10^{8}
HOSPITALS (private)	2	6,315	145,245	3.10×10^{6}
NURSING HOMES (private)	3	1,329	16,945	1.23×10^{6}

Table 12

Total Aggregate Estimate (pounds) for Each Economic Unit
For All Seafood Purchased

Economic Unit	aggregate estimate ($\hat{X}_j$)
Markets	18,229,792
Fast Food Outlets	1,529,324
Federal Agencies	249,314
State/County Agencies	47,208
Hotels/Catering Firms	6,767,046
Restaurants	4,979,603
Retail Fish Markets	19,109,911
Schools	1,003,650
Hospitals (private)	149,339
Nursing Homes (private)	12,100
Total Purchases	52,077,287

Table 13

Total Aggregate Estimate (dollar value) for Each Economic Unit For All Seafood Purchased

Economic Unit	aggregate estimate $(\hat{X}_j)$
Markets	34,720,224
Fast Food Outlets	1,256,811
Federal Agencies	2,543,283
State/County Agencies	66,550
Hotels/Catering Firms	25,978,433
Restaurants	15,295,298
Retail Fish Markets	30,596,595
Schools	1,407,628
Hospitals (private)	208,771
Nursing Homes (private)	21,458
Total Purchases	112,095,051

Table 14

Total Aggregate Estimate (pounds) for Each Economic Unit
For Fresh Fish Purchased

Economic Unit	aggregate estimate ($\hat{X}_j$)
Markets	4,975,379
Fast Food Outlets	20,704
Federal Agencies	0
State/County Agencies	0
Hotels/Catering Firms	1,688,362
Restaurants	1,690,714
Retail Fish Markets	7,367,413
Schools	4,504
Hospitals (private)	0
Nursing Homes (private)	0
Total Purchases	15,747,076

Table 15

Total Aggregate Estimate (dollar value) for Each Economic Unit For Fresh Fish Purchased

Economic Unit	aggregate estimate ($\hat{X}_j$)
Markets	10,619,423
Fast Food Outlets	1,584
Federal Agencies	38,170,400
State/County Agencies	0
Hotels/Catering Firms	8,372,606
Restaurants	4,944,954
Retail Fish Markets	2,301,669
Schools	8,128
Hospitals (private)	0
Nursing Homes (private)	0
Total Purchases	64,418,764

Table 16

Total Aggregate Estimate (pounds) for Each Economic Unit
For Frozen Fish Purchased

Economic Unit	aggregate estimate ($\hat{X}_j$)
Markets	6,087,585
Fast Food Outlets	1,441,363
Federal Agencies	113,900
State/County Agencies	39,600
Hotels/Catering Firms	5,943,783
Restaurants	3,186,172
Retail Fish Markets	6,662,731
Schools	862,516
Hospitals (private)	123,740
Nursing Homes (private)	10,047
Total Purchases	24,431,437

Table 17

Total Aggregate Estimate (dollar value) for Each Economic Unit For Frozen Fish Purchased

Economic Unit	aggregate estimate ($\hat{X}_j$)
Markets	7,320,675
Fast Food Outlets	386,928
Federal Agencies	14,628,275
State/County Agencies	47,964
Hotels/Catering Firms	10,224,804
Restaurants	10,051,141
Retail Fish Markets	11,902,938
Schools	1,198,834
Hospitals (private)	145,245
Nursing Homes (private)	16,945
Total Purchases	55,923,749

Table 18

Total Annual Estimates of Retail Seafood Purchased in 1982

Purchases	Volume (pounds)	Dollar value ($)
total fresh fish	15,747,076	64,418,764
total frozen fish	24,431,437	55,923,749
total seafood	52,077,287	112,095,051

Table 19

Sample Size, Mean Estimate (pounds), Expanded Estimate, and Sample Variance of Total Seafood Sales

Economic Unit	Sample Size (n)	Mean Estimate $\bar{x}$	Expanded Estimate $\hat{X}$	Sample Variance s^2
super market	7	1,281,668	16,264,367	2.13×10^{12}
federal food markets	1	710	11,360	-
large fish markets	12	361,041	12,130,978	1.04×10^{12}
small fish markets	12	36,288	1,351,002	1.85×10^{9}
grocery store	15	6,619	1,820,225	1.32×10^{8}
total sales			31,577,932	

Table 20

Sample Size, Mean Estimate (dollar value),
Expanded Estimate, and Sample Variance of Total Seafood Sales

Economic Unit	Sample Size (n)	Mean Estimate $\bar{x}$	Expanded Estimate $\hat{X}$	Sample Variance s^2
super market	7	235,309	2,986,071	1.16×10^{13}
federal food markets	2	1,441,357	23,061,712	4.14×10^{12}
large fish markets	10	1,344,157	45,163,675	1.16×10^{13}
small fish markets	12	157,742	5,872,735	5.73×10^{10}
grocery store	14	23,853	6,559,575	1.14×10^{9}
total sales			83,643,768	

Table 21

Sample Size, Mean Estimate (pounds), Expanded Estimate, and Sample Variance of Fresh Fish Sales

Economic Unit	Sample Size (n)	Mean Estimate $\bar{x}$	Expanded Estimate $\hat{X}$	Sample Variance s^2
super market	8	336,009	4,263,954	3.18×10^4
federal food markets	1	0	0	-
large fish markets	13	118,273	3,973,973	6.59×10^{10}
small fish markets	13	34,197	1,273,154	3.64×10^9
grocery store	18	1,876	515,900	1.38×10^7
total sales			10,026,981	

Table 22

Sample Size, Mean Estimate (dollar value),
Expanded Estimate, and Sample Variance of Fresh Fish Sales

Economic Unit	Sample Size (n)	Mean Estimate $\bar{x}$	Expanded Estimate $\hat{X}$	Sample Variance s^2
super market	7	1,011,633	12,837,623	2.94×10^{12}
federal food markets	2	432,000	6,912,000	3.73×10^{11}
large fish markets	11	543,586	18,264,490	2.20×10^{12}
small fish markets	12	47,392	1,764,404	4.16×10^{9}
grocery store	16	7,325	2,014,375	2.73×10^{8}
total sales			41,792,872	

Table 23

Sample Size, Mean Estimate (pounds), Expanded Estimate, and Sample Variance of Frozen Fish Sales

Economic Unit	Sample Size (n)	Mean Estimate $\bar{x}$	Expanded Estimate $\hat{X}$	Sample Variance s^2
super market	8	451,630	5,731,185	4.81×10^{11}
federal food markets	1	0	0	-
large fish markets	13	174,918	5,877,245	3.56×10^{11}
small fish markets	18	11,657	433,990	1.16×10^{9}
grocery store	15	1,273	350,075	4.68×10^{6}
total sales			12,342,495	

Table 24

Sample Size, Mean Estimate (dollar value), Expanded Estimate, and Sample Variance of Frozen Fish Sales

Economic Unit	Sample Size (n)	Mean Estimate $\bar{x}$	Expanded Estimate $\hat{x}$	Sample Variance s^2
super market	7	764,247	9,698,294	1.47×10^{12}
federal food markets	2	1,080,000	17,280,000	2.33×10^{12}
large fish markets	13	480,191	16,134,418	2.75×10^{12}
small fish markets	16	57,768	2,150,703	3.78×10^{10}
grocery store	14	4,223	1,161,325	4.06×10^{7}
total sales			46,424,740	

Table 25

Total Annual Estimates of Retail Seafood Purchases and Sales (supermarkets, grocery stores, fish markets, and military markets) in 1982

	Volume (pounds)	Dollar Value ($)
Purchases		
total fresh fish	12,342,792	51,091,492
total frozen fish	12,710,316	33,621,213
total seafood	37,340,413	67,375,507
Sales		
total fresh fish	10,026,981	41,792,892
total frozen fish	12,392,495	46,424,740
total seafood	31,577,932	83,643,768